PURCHASED MARCH '71

INSTRUCTION MANUAL

Type 1232-A,-AP | TUNED AMPLIFIER AND NULL DETECTOR

and S/N 7847

Type 1240-A,-AP | BRIDGE OSCILLATOR-DETECTOR

GENERAL RADIO

CONDENSED OPERATING PROCEDURE

1. 1232-P2 (if used)-set to HIGH Z if input signal source impedance >100 kΩ.
2. AMPLIFIER/PREAMPLIFIER USE
   a. Connect input.
   b. Set METER to LINEAR -20 dB.
   c. Set FILTER FREQUENCY for desired characteristic.
   d. Adjust GAIN as desired.
3. NULL DETECTOR FOR BRIDGE BALANCING
   a. Connect input.
   b. Set METER to LOG.
   c. Set FILTER FREQUENCY and FILTER TUNING as desired.
   d. Set GAIN for 1/2 scale deflection and tune FILTER TUNING for maximum output.
   e. Balance bridge, readjusting GAIN as balance is approached.
4. DETECTOR-DEMODULATOR USE
   For detection of modulated h-f signals, use 1232-A with 874-VQL Detector. Sensitivity is 100 μV F.S. up to 2000 Mc/s. Set FILTER FREQUENCY and FILTER TUNING to the modulating frequency.
5. AUDIO SPECTRUM ANALYSIS
   Sensitivity = 1 μV, bandwidth ≈ 5%; assume constant gain with frequency for approximate measurements.
6. RF HETERODYNE RECEIVER
   Add 1232-P1 RF Mixer ahead of 1232-A and use an apropriate local-oscillator source. Heterodyne receiver frequency range = 70 kc/s to 10 Mc/s (to 60 Mc/s by careful setting of LO).

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SPECIFICATIONS

TYPE 1232-A TUNED AMPLIFIER AND NULL DETECTOR

Frequency Response:

Tunable Filters – 20 c/s to 20 kc/s in 3 ranges; between 2% and 6% bandwidth to 15 kc/s; 2nd harmonic at least 34 dB down from peak, 3rd at least 40 dB down; rejection filter on two highest ranges reduces 60-cycle level to at least 60 dB below peak (50 dB at 50 c/s). Dial accuracy is ±3%.

50- and 100-kc Filters – 2nd harmonic 44 and 53 dB down, respectively.

Flat Response – ±3 dB 20 c/s to 100 kc/s.

Sensitivity: See plot. Typically better than 0.1 μV over most of the frequency range.

Noise Level Referred to Input: See Figure 6. Noise figure at 1 kc/s is less than 2 dB at an optimum source impedance of 27 kΩ.

Noise Level Referred to Output: Less than 5 mV on FLAT filter-frequency position, minimum gain setting, and -20 DB switch position; less than 50 mV in MAX SENS position.

Input Impedance: Approximately 50 kΩ at maximum gain, varies inversely with gain to 1 MΩ at minimum gain.

Maximum Safe Input Voltage: 200 V ac or 400 V dc.

Voltage Gain: 120 dB on the tunable ranges; 100 dB, flat range; 106 dB at 50 kc/s; 100 dB at 100-kc position.

Output: 1 V into 10,000 Ω. Internal impedance is 3000 Ω.

Meter Linearity: DB differences are accurate to ±5% ±0.1 division for input of less than 0.3 V.

Compression (on LOG position): Reduces full-scale sensitivity by 40 dB. Does not affect bottom 20% of scale.

20-dB Position: Reduces gain by 20 dB in linear mode.

Distortion (in FLAT position): Less than 5% (from meter rectifiers).

Power Supply: 12 V dc, from 9 mercury (M72) cells in series. Estimated battery life is 1500 hours. Optionally, a rechargeable battery (non-mercury) can be supplied on special order.

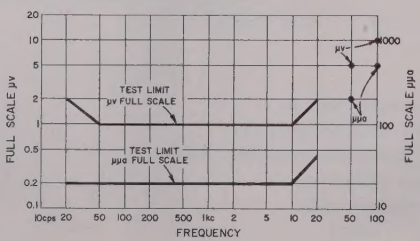
Terminals: Input, GR874® Coaxial Connector; output, binding posts.

Dimensions: Width 8 in (205 mm); height 6 in (155); depth 7½ (190 mm).

Net Weight: 5¾ lb (2.7 kg).

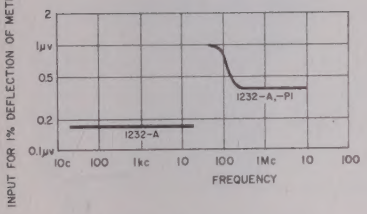
Shipping Weight: 8 lb (3.7 kg).

General Radio Experimenter reference: July 1961, June 1964, June 1965.

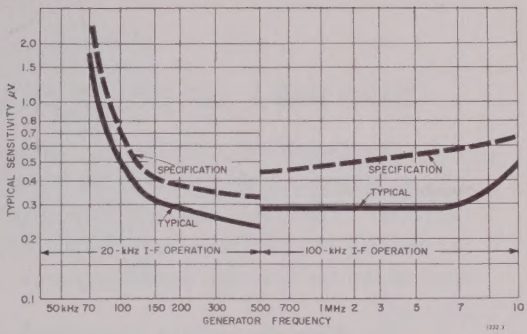


Minimum input for full-scale meter deflection as a function of frequency.

SPECIFICATIONS (cont)



Sensitivity and frequency range of Type 1232-A.



Sensitivity of 1232-P1 (open-circuit voltage from 50-Ω source, equivalent to noise level).

TYPE 1232-P1 RF MIXER

(Accessory not supplied)

Frequency Range: 70 kc/s to 10 Mc/s. (Can be used up to 60 Mc/s, with care in the selection and identification of local-oscillator frequencies). Recommended local oscillators for the 70-kc to 0.5-Mc and the 0.5- to 10-Mc ranges are Type 1210-C and Type 1211-C, respectively.

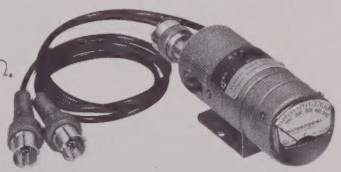
I-F Output Frequencies: Switch-selected to 20 kc/s or 100 kc/s.

Bandwidth: 0.8 kc/s in 20-kc position, 10 kc/s in 100-kc position with a 20 kΩ output load (Type 1232-P1 RF Mixer alone).

Sensitivity: See plot.

Input Impedance: Approximately 200 Ω.

Output Impedance: Approximately 20,000 Ω.



Dimensions: Diamenter 2¼, length 6¾ in (58, 175 mm).

Net Weight: 1 lb (0.5 kg).

Shipping Weight: 3 lb (1.4 kg).

General Radio Experimenter reference: December, 1963.
U. S. Patent No. 2,548,457 and D 187,740.

TYPE 1232-P2 PREAMPLIFIER

(Accessory supplied with Type 1232-AP and Type 1240-AP only)

Input Impedance: Greater than 100 MΩ in parallel with 70 pF.

Output Impedance: 10 kΩ.

Voltage Gain: Approximately 0.7.

Noise Referred to Input: When the Preamplifier is connected to a Type 1232-A Tuned Amplifier and Null Detector set to 100 Hz selective, the equivalent noise generators at the input are:

Open-circuit noise < 0.1 μμA
Short-circuit noise < 0.3 μV.

Optimum Source Impedance: 3 MΩ.

TYPE 1240-A, -AP BRIDGE OSCILLATOR-DETECTORS

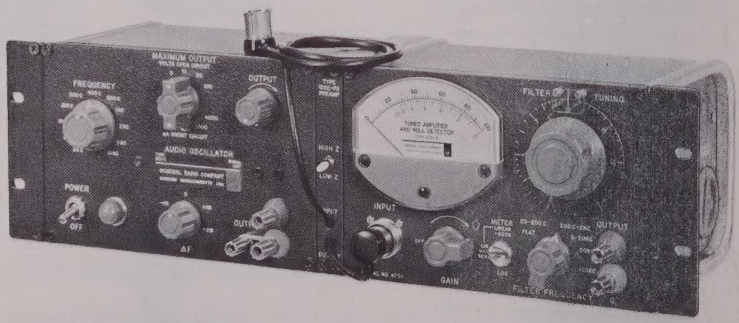
The Type 1240-A Bridge Oscillator-Detector is a rigid assembly of a Type 1311 Audio Oscillator and a Type 1232 Tuned Amplifier and Null Detector. The Type 1240-AP includes the Type 1232-P2 Preamplifier in addition to the above instruments. These compact assemblies are convenient for use with audio-frequency bridges and other null-balance devices.

The units are secured with an Adaptor Plate Set (P/N 0480-9836 for 1240-A, 0480-9837 for 1240-AP) and bolted together near the rear of the instruments. The assembly fits a standard 19-inch relay rack. For bench use, the two wings of the relay-rack adaptor set can be removed and the four rubber feet can be installed in the corners of the oscillator-detector assembly.

Supplied with the Type 1240-A or Type 1240-AP Bridge Oscillator-detector are a Type CAP-22 Power Cord and spare fuses. Operating instructions for the Type 1232-A or -AP Tuned Amplifier and Null Detector are given in this book. A separate instruction book is supplied for the Type 1311 Audio Oscillator.

NOTE

Separate detailed instructions are furnished for the Type 1311 and the Type 1232-P2 as required.



Type 1240-AP Bridge Oscillator-Detector fitted for rack mounting.

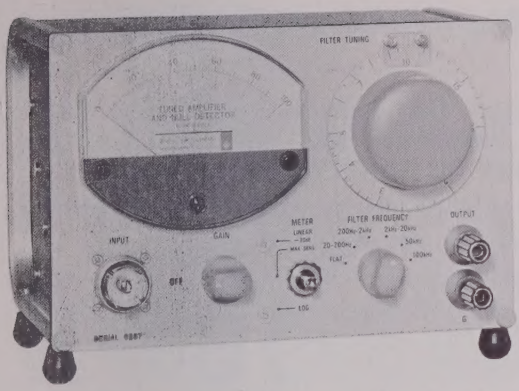


Figure 1. Type 1232-A Tuned Amplifier and Null Detector.

Section 1
INTRODUCTION

1.1 PURPOSE.

The Type 1232-A Tuned Amplifier and Null Detector (Figure 1) is a sensitive, low-noise amplifier continuously tunable from 20 cps to 20 kc, with additional fixed-tuned frequencies of 50 kc and 100 kc. Intended primarily as a bridge detector, the Type 1232-A can also be used as a detector of high-frequency modulated signals (with a crystal demodulator), a wave analyzer at audio frequencies, and a preamplifier for transducers. It is usable to 10 Mc by addition of Type 1232-P1 RF Mixer.

The Type 1232-P2 Preamplifier can be added to improve the signal-to-noise ratio and consequently the effective sensitivity of the Type 1232-A when the latter is to be driven by very high (greater than 100 kΩ) impedance sources.

1.2 DESCRIPTION.

The Type 1232-A consists of a low-noise preamplifier, a frequency-selective stage (feedback amplifier and null network), an amplifier-compressor stage, and a meter-rectifier circuit (see block diagram, Figure 2). The total gain of the amplifier is about 120 db. Full-scale meter sensitivity is 1 microvolt or better over most of the frequency range.

With the Type 1632 Inductance Bridge, this null detector permits inductance balances to a resolution of 1 part in 10^6. Comparable precision for capacitance balance can be obtained with the Type 1615

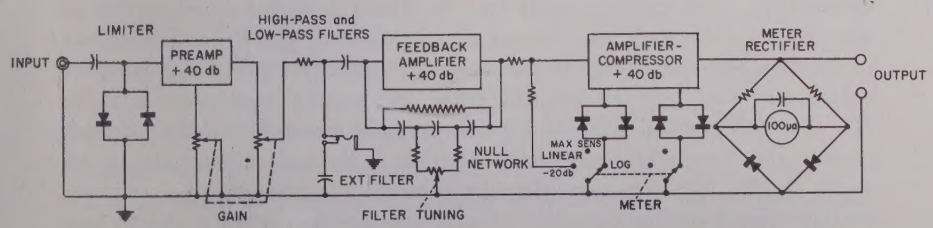


Figure 2. Functional diagram of the null detector.

and 716 Capacitance Bridges. Useful also as a null detector for r-f bridges such as the Types 916-AL and 1606 (to 10 Mc) with Type 1232-P1 RF Mixer accessory.

The amplifier is powered by 12 volts dc, supplied by nine mercury batteries in series. The output is 1 volt into 10,000 ohms.

Front mountings are extendible to tilt instrument face.

The Type 1232-P2 Preamplifier is a detachable accessory that consists of a low-noise field-effect transistor used in common-source configuration. Power for the preamp is provided by the B+ supply of the Type 1232-A.

1.3 CONTROLS AND CONNECTORS OF THE TYPES 1232 AND 1232-P2.

TABLE 1

	Name	*Type*	*Function*
Type 1232	FILTER TUNING	Continuous rotary control	Tunes filter within selected tuning range.
	FILTER FREQUENCY	6-position rotary switch	Selects desired frequency characteristic; tuning-frequency range of 20-200 cps, 200 cps-2 kc, or 2-20 kc; flat, 50-kc or 100-kc response.
	GAIN	Rotary control	Turns instrument on or off and controls gain.
	METER	3-position toggle switch	Selects full-gain linear, -20-db linear, or logarithmic response.
	INPUT	GR874 Locking Coaxial Connector	Input terminals.
	OUTPUT	Pair of Type 938 Binding Posts	Output terminals.
	EXTERNAL FILTER	Phone jack	Connection for external filter.
Type 1232-P2	HIGH Z, LOW Z	Toggle switch	Determines whether Preamplifier is included in input to Type 1232 (HIGH Z) or shunted (LOW Z).
	INPUT	GR874 Connector and Cable Assembly	Input terminals.
	OUTPUT	GR874 Connector and Cable Assembly	Output terminals (to be applied to INPUT of Type 1232).

1.4 USE OF EXTERNAL FILTERS.

Filters can be connected at the EXTERNAL FILTER jack. When a telephone plug is inserted in this jack, the built-in shunt filter is disconnected. The external filter may be either a series-tuned circuit to trap out an undesired frequency or an antiresonant parallel-tuned circuit to improve the selectivity at the desired frequency. For the purpose of calculating the Q of the external filter, the source impedance is about 700 ohms. Since the external filter is plugged into the circuit at a point beyond the 60-cps rejection filter and where there is 80-db gain to the meter circuit, it is important that the external filter be shielded and preferably that it use a toroidal inductor for minimum sensitivity to hum pickup.

Section 2
PRINCIPLES OF OPERATION

2.1 PREAMPLIFIER OF THE TYPE 1232-A.

The preamplifier stage of the Type 1232-A Tuned Amplifier and Null Detector is designed to minimize noise from both low-impedance sources, such as inductance bridges at low frequencies, and high-impedance sources, such as capacitance bridges at low frequencies.[1] A transistor with a noise figure of 3 to 5 db at an optimum source impedance of 50 kilohms is used. By use of negative feedback, the input impedance of the preamplifier is also made 50 kilohms, and the noise level indicated on the output meter is relatively constant and independent of source impedance.

The input transistor is protected from possible damage due to large overloads by a limiter consisting of a series capacitor and two shunt silicon rectifier diodes. This circuit effectively prevents signals greater than 1 volt, peak-to-peak, from reaching the input transistor and does not contribute noise or distortion to low-level signals.

Maximum gain of the preamplifier is about 40 db, which is adequate to swamp the noise of succeeding stages. After preamplification, the signal passes through a set of series and shunt filters, which are designed to reject frequencies above and below the selected tuning range. Typical filter characteristics are shown in Figure 3. On all switch po-

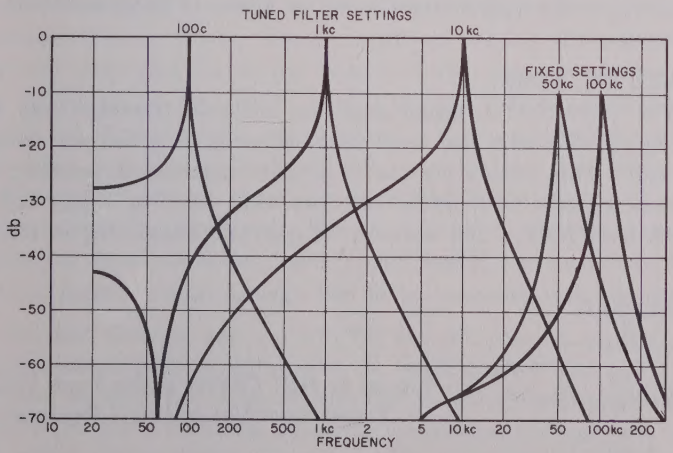


Figure 3. Typical filter characteristics of the Type 1232-A.

[1] A. E. Sanderson and R. G. Fulks, "A Simplified Noise Theory, and its Application to the Design of Low-Noise Amplifier," IRE Transaction on Audio, July-August, 1961.

sitions except FLAT and 20 - 200 C, another rejection filter reduces the response at 60 cps to greater than 60 db below peak response.

2.2 FREQUENCY-SELECTIVE AMPLIFIER.

This amplifier consists of three stages with negative feedback through a null network, which has its null at the desired operating frequency. Since there is negative feedback at all frequencies but the desired one, the over-all response peaks at this frequency and is roughly equivalent to that of a tuned circuit with a Q of about 20 (5% bandwidth). The unique feature of this null network is its one-potentiometer tuning. Many null networks require three variable elements, either ganged capacitors or ganged potentiometers. This leads to many problems in alignment and tracking the three elements to maintain a good null. The Hall null network[2] has a perfect null in theory for any position of the tuning potentiometer, and it is possible to cover a 10:1 tuning range with a 40-db exponential potentiometer. Tuning capacitors are switched to change ranges, maintaining the impedance level of the null network approximately constant for the three tuning ranges.

Since the 50-kc and 100-kc null networks need not be tunable, conventional twin-T null networks are used.

On the FLAT position of the range switch, all filters are switched out and the frequency response is flat to within ±3 db from 20 cps to 100 kc. The overall gain of the amplifier is reduced by 26 db to keep the noise level on the output meter equal to about 10 percent of full scale at maximum gain.

2.3 NULL NETWORK.

The Type 1232-A Tuned Amplifier and Null Detector uses an RC null network with only one variable component to adjust the frequency of the null. This avoids the use of ganged variable components, which must track closely to maintain stability when used in highly selective feedback amplifiers. The network (Figure 4), consisting of three-ter-

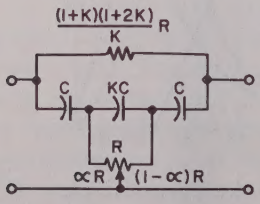


Figure 4. Null Circuit of the Type 1232-A Tuned Amplifier and Null Detector.

[2] Henry P. Hall, IRE Transactions on Circuit Theory, September 1955, Vol CT-2, No. 3, p 283; *General Radio Experimenter*, Vol 35, No. 7, July, 1961, p 8.

minal RC circuits, gives a complete null without being balanced against a voltage divider, and permits frequency adjustment with a single potentiometer. The tuning law for this circuit is

$$\omega_o = \frac{1}{RC\sqrt{\alpha(1-\alpha)(1+2k)}}$$

In order to span a 10-to-1 logarithmic frequency range, the potentiometer must have an exponential characteristic of over 100 to 1.

The selectivity of the transfer admittance, $\frac{I_o}{E_{in}}$ (or y_{21}), is quite constant as the null frequency is changed. In order to use this characteristic, the network must be driven by and loaded by low impedances. Therefore, it is used in a feedback circuit with an amplifier having low input and output impedances and a transfer resistance $\frac{E_o}{I_{in}}$ (or a real z_{21}) that is chosen to give the desired selectivity. This combination provides a second-harmonic rejection of 34 db over each 10-to-1 frequency range.

2.4 AMPLIFIER-COMPRESSOR.

With the METER switch set to either linear position, the amplifier-compressor functions as a linear amplifier, driving the meter rectifier circuit and supplying the output terminals with about 1.4 volts for full-scale deflection of the meter. The LIN MAX SENS position provides full gain for very low-level applications. When maximum sensitivity is not required, use the LINEAR -20 DB position for a less noisy output. With this switch setting, the noise generated in the input and selective amplifier stages is attenuated. The dc supplied to the last transistor is sufficient to drive the output meter to full scale, but very little more, so that it is impossible to damage the meter by overdriving the amplifier.

For null detector use, the METER switch is thrown to LOG, effectively compressing the upper part of the meter scale. Two pairs of silicon diodes are switched in shunt with the collector resistors of two transistors to provide a nonlinear collector impedance. Owing to the voltage offset of the silicon diodes, the bottom 20 percent of the meter scale is virtually unaffected. A signal level corresponding to 100 percent deflection for linear response will drop to 50 percent for logarithmic response. An increase of 20 db increases the reading to 80 percent, and another 20 db raises the reading to 100 percent.

2.5 METER CIRCUIT.

The meter circuit uses a full-wave rectifier in order to double the ripple frequency that passes through the meter and thus to prevent the needle from vibrating visibly at 20 cps. Resistors are used in place of two of the rectifiers in the conventional full-wave bridge in order to linearize the relation between meter indication and signal level, and to minimize distortion. No dc amplification was incorporated into the meter circuit, so that there is no need for a dc zero adjustment on the front panel and no possibility of dc zero instability. High-impedance, crystal-type earphones can be connected to the output terminals.

Section 3
OPERATING PROCEDURE

3.1 USE AS AN AMPLIFIER OR PREAMPLIFIER.

To use the Type 1232-A or -AP Tuned Amplifier and Null Detector as an amplifier:

a. Connect the input signal to the INPUT connector of the Type 1232 or, if used, the Type 1232-P2. Adaptors for connectors other than Type 874 are available from General Radio (see table at rear of this manual). If the output impedance of the source of this signal is greater than 100 kΩ, set the switch on the Type 1232-P2, if used, to HIGH Z; otherwise set the switch to LOW Z.

NOTE

For connection to binding posts, use a Type 874-R34 Patch Cord. (Hum pickup is too great with a Type 874-Q2 Adaptor.)

b. Set the METER switch to LINEAR -20 DB (unless maximum sensitivity is required).

c. Set the FILTER FREQUENCY switch for the desired characteristic: FLAT, 20-200 C, 200 C - 2 KC, 2-20 KC, 50 KC, or 100 KC.

d. With the GAIN control, turn the instrument on and adjust the gain to the desired level. The total range of the GAIN control is 120 db, and attenuation in db is roughly proportional to the rotation angle of the control knob.

e. The OUTPUT terminals may be connected to an oscilloscope or headphones. The red binding post is high, the black binding post is ground.

The high sensitivity of this instrument permits its use as a preamplifier for transducer outputs or oscilloscope input.

3.2 USE AS A NULL DETECTOR FOR BRIDGE BALANCING.

To use this instrument as a detector for bridge measurements:

a. Connect the INPUT terminals of the Type 1232-A or -AP to the DETECTOR terminals of the bridge as in paragraph 3.1, step a.

b. Set the METER switch to LOG.

c. Set the FILTER FREQUENCY and FILTER TUNING controls to the desired frequency.

d. With generator and unknown connected to the bridge, set the GAIN control of the Type 1232-A for approximately half-scale deflection of the output meter, and tune the FILTER TUNING control for maximum output.

The bridge balance can now be made in the conventional manner, readjustment of the GAIN control as balance is approached.

3.3 USE AS A DETECTOR-DEMODULATOR.

For the detection of modulated high-frequency signals, the Type 1232-A Amplifier and Null Detector can be used with the Type 874-VQ Voltmeter Detector. Sensitivity is approximately 100 μv full-scale up to about 2000 Mc. The crystal output of the Type 874-VQ Voltmeter Detector should be connected through a Type 874-R22A Patch Cord to the INPUT connector of the Type 1232-A. The FILTER FREQUENCY and FILTER TUNING controls should be set to the frequency of the modulation on the high-frequency signal.

3.4 USE IN AUDIO SPECTRUM ANALYSIS.

The tuned amplifier can be used as an audio-frequency wave analyzer with a sensitivity of 1 μv and a bandwidth of about 5 percent. For approximate measurements, the gain can be assumed to be constant with frequency. More accurate measurements can be obtained if the amplifier is first calibrated with a constant-amplitude, variable-frequency signal. The typical variation of peak response vs frequency is shown in Figure 5.

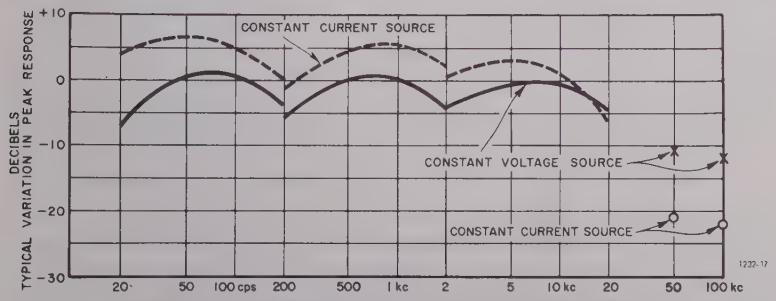


Figure 5. Typical variation in peak response with frequency for constant gain-control setting.

3.5 RF HETERODYNE RECEIVER.

By adding the accessory Type 1232-P1 RF Mixer ahead of the Type 1232-A and using an appropriate local-oscillator source, a sensitive well-shielded, heterodyne receiver with good harmonic rejection can be assembled. It has a frequency range from 70 kc to 10 Mc (good to 60 Mc by careful LO setting). When the frequency of the local oscillator is swept, the combination can be used for approximate spectrum analysis with an oscilloscope. It can also be used as a sensitive level indicator in attenuation measurements.

Section 4
SERVICE AND MAINTENANCE

4.1 WARRANTY AND SERVICE.

We warrant that each new instrument manufactured and sold by us is free from defects in material and workmanship and that, properly used, it will perform in full accordance with applicable specifications for a period of two years after original shipment. Any instrument or component that is found within the two-year period not to meet these standards after examination by our factory, District Office, or authorized repair agency personnel will be repaired or, at our option, replaced without charge, except for tubes or batteries that have given normal service.

The two-year warranty stated above attests the quality of materials and workmanship in our products. When difficulties do occur, our service engineers will assist in any way possible. If the difficulty cannot be eliminated by use of the following service instructions, please write or phone our Service Department, giving full information of the trouble and of steps taken to remedy it. Be sure to mention the serial and type numbers of the instrument.

Before returning an instrument to General Radio for service, please write to our Service Department or nearest District Office (see back cover), requesting a Returned Material Tag. Use of this tag will ensure proper handling and identification. For instruments not covered by the warranty, a purchase order should be forwarded to avoid unnecessary delay.

4.2 REMOVAL OF COVER.

To open the instrument for access to transistors and components, loosen the two fluted captive screws at the rear of the instrument and slide the U-shaped dust cover away from the panel. All transistors and components are now accessible.

4.3 BATTERY INSTALLATION.

The Type 1232-A Tuned Amplifier and Null Detector is powered by nine M72 mercury batteries (Mallory RM-4R or equivalent), which will last for over 1500 hours with normal use. For a simple check of the batteries, measure the dc voltage between anchor terminal 6 and ground. This should be 12 volts.

To replace the batteries, remove the cap (twist counterclockwise and pull out) on the right-hand side of the instrument under the M72 CELLS engraving. Insert the 1 ¼ in. spacer (1232-6010) in the opening on the right-hand side of the instrument, under the M72 CELLS engraving. Push it in to the end of the compartment. Then, insert the nine batteries with the positive (+) terminal as marked on the battery facing into the instrument. Finally place the cap (battery-keeper assembly, 1650-2120) in position, twisting it approximately ¼ turn in either direction to lock it in position.

4.4 INTERNAL NOISE.

4.4.1 Noise Indicated by Meter. At certain frequencies the sensitivity of the Type 1232-A Tuned Amplifier and Null Detector greatly exceeds the catalog specifications. With maximum gain at these frequencies, the noise generated by transistor Q100 normally causes large deflection of the output meter. For maximum useful gain, the GAIN control should be set low enough so that the noise level at the output is not greater than 10 percent of full scale.

For minimum sensitivity to hum pickup and stray fields, input connections must be shielded. Do not use an adaptor from the Type 874 INPUT connector to binding posts; use a shielded Type 874 cable.

If, with completely shielded input connections, the noise level of the Type 1232-A greatly exceeds the values given in Figure 6, the noise is probably caused by Q100. If it is necessary to replace this transistor, a replacement with a high β (beta) will usually give the lowest noise levels.

It is possible, but not likely, that Q101 will contribute significantly to the internal noise. If it is necessary to replace Q101, select a Type 2N169A transistor with a β greater than 60.

4.4.2 Noise From the Type 1232-P2. The equivalent noise sources of the Type 1232-AP with the FILTER FREQUENCY set to 100 c/s are a current source of less than 0.1 $\mu\mu$A and a voltage source of less than 0.3 μV. If the noise levels of the Type 1232 alone do not exceed the values of Figure 6, yet the Type 1232-AP will not meet the above specifications, replace the transistor in the Type 1232-P2.

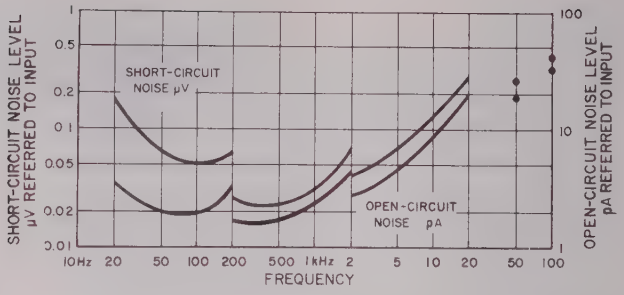


Figure 6. Typical noise levels as a function of frequency.

4.4.3 Output Noise. Due to the large amount of amplification that follows the GAIN control there is always a small amount of noise present at the OUTPUT terminals. At minimum gain, and with the FILTER FREQUENCY control set to FLAT or with a FILTER FREQUENCY of 5 kc/s or lower, this noise should be less than 50 mv with the METER switch set to LIN MAX SENS and should cause no more than 1 percent deflection of the output meter. With the METER switch set to LINEAR -20 DB, this noise should be less than 5 mv.

If the noise is greater than 50 mv with minimum gain and LIN MAX SENS switch setting, the trouble is probably caused by Q200, Q201, or Q202. If this noise level is less than 50 mv and the noise with LINEAR -20 DB switch setting is greater than 5 mv, the faulty component is probably Q203, Q204, or Q205.

TABLE 2 VOLTAGES AND RESISTANCES

Transistor (Type)	Term.	Dc Volts To Ground	Ohms To Ground	Transistor (Type)	Term.	Dc Volts To Ground	Ohms To Ground
Q100 (TR-2/2N929)	C	7.8	222 k	Q202 (2N1395)	C	0	0
	E	3.6	220 k		E	3.5	11 k
	B	3.7	3.3 M		B	3.3	22 k
Q101 (TR-1/2N169A)	C	11.6	2.2 k	Q203 (TR-1/2N169A)	C	1.7	100 k
	E	7.7	40 k		E	0.4	4.7 k
	B	7.8	222 k		B	0.5	42 k
Q200 (TR-1/2N169A)	C	7.4	34 k	Q204 (TR-1/2N169A)	C	3.6	47 k
	E	3.6	33 k		E	1.6	10 k
	B	3.7	120 k		B	1.7	100 k
Q201 (2N1395)	C	3.3	22 k	Q205 (TR-1/2N169A)	C	7.2	4.4 k
	E	7.8	23 k		E	3.5	3.3 k
	B	7.4	34 k		B	3.6	47 k
Q101 of Type 1232-P2 (C6601A)	D	12.0	3.2 k				
	S	0.7 to 2.5	10k				
	G	*	1 G				

* Impedance too high to permit measurement.

4.5 TRANSISTOR VOLTAGE AND RESISTANCE MEASUREMENTS.

Table 2 gives the normal voltage and resistance measurements from transistor terminals to ground. A deviation of 10 percent from any of these values is not necessarily abnormal.

1. Before making transistor voltage measurements, make sure that the battery voltage is approximately 12 volts (refer to paragraph 4.3). Turn the instrument on but leave the GAIN control counterclockwise, set the FILTER FREQUENCY, switch to FLAT and the METER switch to LINEAR. Measure voltage with a vacuum-tube voltmeter.

2. Before making resistance measurements, remove all the batteries and short-circuit anchor terminal 6 to ground. Remove all transistors. Set the GAIN control to OFF, the FILTER FREQUENCY switch to FLAT, and the METER switch to LINEAR.

4.6 TRIMMER-CAPACITOR ADJUSTMENT.

Normally, the factory-set trimmer capacitor adjustment (C202) will not require attention. However, adjustment may be necessary if transistor Q201, Q203, or Q204 is replaced. If the frequency response for the FLAT characteristic is outside the specified limits, adjust the trimmer capacitor as follows:

a. With the FILTER FREQUENCY switch set at FLAT and a 1-kc signal at the INPUT connector, adjust the GAIN control for a 5-db meter indication.

b. With the GAIN and FILTER FREQUENCY controls unchanged, apply a 100-kc signal (of the same amplitude as the 1-kc signal) to the INPUT connector and adjust the trimmer capacitor, C202, for a meter indication of 5 db. Check the frequency response below 100 kc to make sure it is within the specified limits.

c. With same settings, use continuously variable source to check that response is flat within ±3 db from 20 cps to 100 kc. Adjust with C 202, if necessary.

4.7 MINIMUM PERFORMANCE STANDARDS

4.7.1 General

The following tests are provided to demonstrate compliance of the 1232-A with published specifications at incoming inspection or following repair or calibration.

4.7.2 Test Equipment

The items listed in Table 3 are recommended for performance of the ensuing tests.

TABLE 3

Instrument	*Recommended Type**
Audio Frequency Microvolter	GR 1346
Frequency Meter and Discriminator	GR 1142
Cable	GR 274-NQM
Unit RC Oscillator	GR 1309
Adjustable Filter	GR 1952
VTVM	Ballantine Model 314
Shielded Patch Cord	GR 874-R34
Short-Circuit Termination	GR 874-WNL
Open Circuit Termination	GR 874-WO
Insertion Unit	GR 874-X
5.1 MΩ resistors, 5% (2 required)	----------

*or equivalent

4.7.3 Noise Check

Connect the 314 VTVM to the 1232-A OUTPUT terminals (via the 274-NQM cable) and set controls as follows:

a. 314 VOLTS FULL SCALE switch to 0.1.
b. 1232-A GAIN control on , but fully ccw.
c. 1232-A FILTER FREQUENCY switch to FLAT.
d. 1232-A METER switch to LINEAR.

The VTVM indication (noise) should be .03-V maximum.

4.7.4 Filter Tuning Dial

Connect equipment as shown in Figure 7-A.

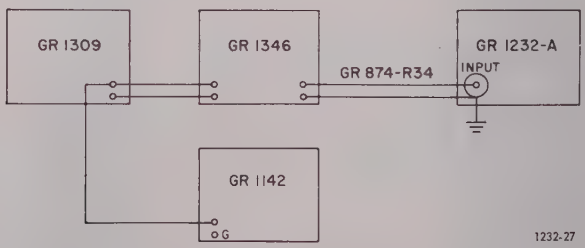


Figure 7-A. Filter Tuning Dial Test Set-up.

Set controls as follows:

a. Set oscillator to 1 kc/s.
b. Set 1346 to 1 mV.
c. Set 1142 METER FUNCTION switch to INTERPOLATION.
d. Set 1142 INTERPOLATION OFFSET FREQUENCY switch to 0.9.
e. Set 1142 range switch to 1.5 kc/s.
f. Set 1142 INPUT WAVEFORM to sinusoidal.
g. Set 1232-A FILTER FREQUENCY switch to 200 c/s-2 kc/s
h. Set 1232-A METER switch to LINEAR.

The reading on the 1142 meter should reach a peak when the FILTER TUNING dial of the 1232-A is at 10.

Change the 1142 METER FUNCTION switch to DIRECT. Set the FILTER TUNING dial on the 1232-A to each of the numbered points (2, 3, 4, 5, 7, 10, 15, 20) and adjust the frequency for a peak reading on the 1232-A meter. In each case, the frequency read on the 1142 meter should be within ±3% of the nominal value on the 1232-A FILTER TUNING dial.

Repeat the test at 100 c/s, 20 c/s, and 200 c/s on the 20-200 c/s range, and at 2 kc/s, 10 kc/s, and 20 kc/s on the 2-20 kc/s range. Also check 50- and 100-kc/s (via the 1232-A FILTER FREQUENCY switch). In each case set the 1142 range switch to its proper position before setting the frequency. Pad as necessary by either adding or subtracting 100 pF (a change of 100 pF approximates a 0.7% frequency change.) The FILTER TUNING dial is not in the circuit at 50- and 100-kc/s. At each step the FILTER TUNING dial should be accurate to within ±3% of the frequency read on the 1142 meter.

4.7.5 Frequency Response

Set the following controls (same set-up as above):

a. Set Oscillator to 1 kc/s.
b. Set 1346 to 10 mV.
c. Set 1232-A FILTER FREQUENCY switch to FLAT.
d. Set 1232-A METER switch to LINEAR.
e. Adjust 1232-A GAIN for a 5 dB reading on the 1232-A meter.

Change the frequency to 100 kc/s and note a 1232-A meter reading of approximately 4 dB.

With a constant input voltage, the frequency response from 100 kc/s to 20 c/s should be between 3 and 7 dB.

Repeat the test at 100 c/s, 1 kc/s, 10 kc/s, 50 kc/s, and 100 kc/s, adjusting the GAIN control to assure adequate gain for full-scale deflection in each case.

4.7.6 Gain

Set the following:

a. Set oscillator to 1 kc/s.
b. Set 1346 to 1-V.
c. Set 1232-A FILTER TUNING dial to 10.
d. Set 1232-A FILTER FREQUENCY switch to 200 c/s-2 kc/s.
e. Set 1232-A METER switch to LINEAR.

Under these conditions it must be possible to adjust the 1232-A GAIN control for a full-scale reading on the 1232-A meter.

Repeat the test for full-scale deflection with the 1346 set at 1 μV.

Set the GAIN control 120° clockwise from the off position and adjust the 1346 for a full-scale reading of the 1232-A meter. The 1346 should indicate between 320 μV (50 dB) and 3.2 mV (70 dB).

4.7.7 Meter Linearity

Set the following controls:

a. Set oscillator to 1 kc/s.
b. Set the 1346 to 3.2 mV (70 dB).
c. Set 1232-A FILTER FREQUENCY switch to FLAT.
d. Set the 1232-A METER switch to LINEAR.

Adjust the GAIN control for full-scale (0 dB) on the 1232-A meter. Decrease the 1346 output to 1.8 mV (65 dB). The 1232-A meter should indicate 4.7 to 5.3 dB.

Decrease the 1346 output to 1 mV (60 dB). The 1232-A meter should now read 9.5 to 10.5 dB.

Change the 1346 to 100 μV output and adjust the 1232-A GAIN for a full-scale reading on the 1232-A meter. Make the following checks:

1232-A METER switch	1346 output	1232-A meter must read:
-20 dB	100 μV	5 to 7 dB
LOG	100 μV	40 to 50 dB
LOG	1 mV	70 to 80 dB
LOG	10 mV	approximately 90 dB
LOG	100 mV	greater than previous reading

4.7.8 Signal to Noise Ratio

Disconnect the 1142 from the set-up of Figure 4.7-A and connect the VTVM to the 1232-A OUTPUT. Set controls as follows:

a. Set oscillator to 20 c/s.
b. Set 1232-A FILTER TUNING dial to 21
c. Set 1232-A FILTER FREQUENCY switch to 20-200 c/s.
d. Set 1232-A METER switch to LINEAR.

Disconnect the 1346 from the 1232-A and short the 1232-A input with the 874-WNL. Adjust the GAIN control for an indication of 0.1 V on the VTVM. Remove the input short and reconnect the 1346 to the 1232-A INPUT. Adjust the 1346 for an indication of 1.0 V on the VTVM; this should require an indication of 10 μV maximum on the 1346 meter.

Repeat the above procedure, with the same results (10 μV maximum on 1346), for the following conditions:

Frequency	Shorted INPUT
1 kc/s	3.5 μV
10 kc/s	8 μV
100 kc/s	30 μV

Disconnect the 1346 and install the 874-WO at the 1232-A INPUT. Adjust GAIN for 0.1 V on the VTVM. Remove the 874-WO. Connect, to the 1232-A input, a fixture consisting of two 5.1-MΩ resistors in series within the 874-X Insertion Unit. Connect the 1346 to the other end of the fixture. With the oscillator at 20 c/s, adjust the 1346 to produce a 1.0-V reading on the VTVM. The 1346 indication must be 1 mV maximum.

Repeat the above procedure for the following conditions:

Frequency	Maximum Limit
1 kc/s	700 μV
10 kc/s	2 mV
100 kc/s*	15 mV

*At 100 kc/s, set the 1346 to a 10-μV input.

4.7.9 Harmonic Rejection

Use the set-up of Figure 4.7-A and set controls as follows:

a. Set oscillator at 1 kc/s.

b. Set 1346 at 1 μV.
c. Set 1232-A FILTER TUNING dial at 10.
d. Set 1232-A FILTER FREQUENCY switch at 200 c/s-2 kc/s.
e. Set 1232-A METER switch at LINEAR.

Adjust the GAIN control for a full-scale reading on the 1232-A meter. Set the oscillator at the following frequencies, and in each case readjust the output of the 1346 to give a full-scale reading of the 1232-A meter. The 1346 should indicate as follows:

Frequency	Minimum 1346 reading
2 kc/s	63 μV (36 dB)
10 kc/s	3.2 mV (70 dB)
500 c/s	16 μV (24 dB)
60 c/s	1 mV (60 dB)

Reset the oscillator to 100 c/s and the 1346 to 1 μV. Tune the FILTER TUNING dial for a peak and adjust the GAIN control for a full-scale reading of the 1232-A meter. Change the oscillator to 200 c/s and readjust the 1346 for a full-scale 1232-A meter reading. The 1346 must indicate 57 μV (35 dB) minimum.

Set the oscillator to 10 kc/s (as indicated on the 1142) at a 1 mV level. With the 1232-A range at 2-20 kc/s, adjust the FILTER TUNING dial for peak response on the 1232-A meter. Adjust GAIN for full-scale deflection. Turn the FILTER TUNING dial ccw to obtain a meter reading 3 dB below full scale. Turn the oscillator frequency dial ccw through a peak meter indication and beyond, until the 1232-A meter again reads 3 dB below full scale. The frequency, indicated on 1142, should be between 10.30 and 10.50 kc/s.

Reset the oscillator to 10 kc/s, the 1346 to 1 μV, and the FILTER TUNING dial to 10. Tune the FILTER TUNING dial for a peak and adjust the GAIN for a full-scale deflection on the 1232-A meter. Change the oscillator to 20 kc/s and readjust the 1346 output for a full-scale reading on the 1232-A meter. The 1346 must indicate 57 μV (35 dB) minimum.

Set the oscillator to 50 kc/s, the 1346 to 5 μV, and the FILTER FREQUENCY switch to 50 kc/s. Adjust GAIN for full-scale on the 1232-A meter. Set the oscillator at the following frequencies, and in each case readjust the 1346 output to give a full-scale reading on the 1232-A:

Frequency	Minimum 1346 reading
100 kc/s	1 mV (60 dB)
10 kc/s	1.4 mV (63 dB)

Set the oscillator to 100 kc/s, 1346 to 10 μV, and the FILTER FREQUENCY switch to 100 kc/s. Adjust GAIN for full-scale deflection on 1232-A. Set the oscillator at the following frequencies, and in each case readjust the 1346 output to give a full-scale reading on the 1232-A:

Frequency	Minimum 1346 reading
200 kc/s	3.2 mV (70 dB)
20 kc/s	1 mV (60 dB)

4.7.10 External Filter

Set the oscillator at 10 kc/s, 1346 at 100 μV, the FILTER FREQUENCY switch to FLAT, and the METER switch to LINEAR. Connect the 1952, set for 10-kc/s band pass, to the EXTERNAL FILTER jack on the side of the 1232-A. Adjust the oscillator for peak reading on 1232-A, then adjust GAIN for full-scale. Change the frequency to 100 kc/s. Adjust the 1346 for full-scale reading on the 1232-A meter. The 1346 must indicate 1 mV (60 dB) minimum.

4.8 KNOBS

If it should be necessary to remove a knob, to replace a damaged switch or knob, proceed as follows:

a. Grasp the knob firmly with the fingers, close to the panel, and pull the knob straight away from the panel.
b. Observe the position of the set screw in the bushing with respect to any panel markings.
c. Release the set screw and pull the housing off the shaft, using an Allen wrench.

NOTE

To separate the bushing from the knob, if for any reason they should be combined off the instrument, drive a machine tap a turn or two into the bushing for sufficient grip for easy separation.

To install the snap-on knob assembly on the control shaft:

a. Mount the bushing on the shaft, using a small slotted piece of wrapping paper as a shim for adequate panel clearance.

b. Orient the set screw on the bushing with respect to the panel marking index and lock the set screw with an Allen wrench.

NOTE

Make sure the end of the shaft does not protrude through the bushing or the knob will not set properly.

c. Place the knob on the bushing with the retention spring opposite the set screw.

d. Push the knob in until it bottoms in the groove in the bushing.

NOTE

If the retention spring in the knob becomes loose, reinstall it in the interior notch with the small slit in the wall.

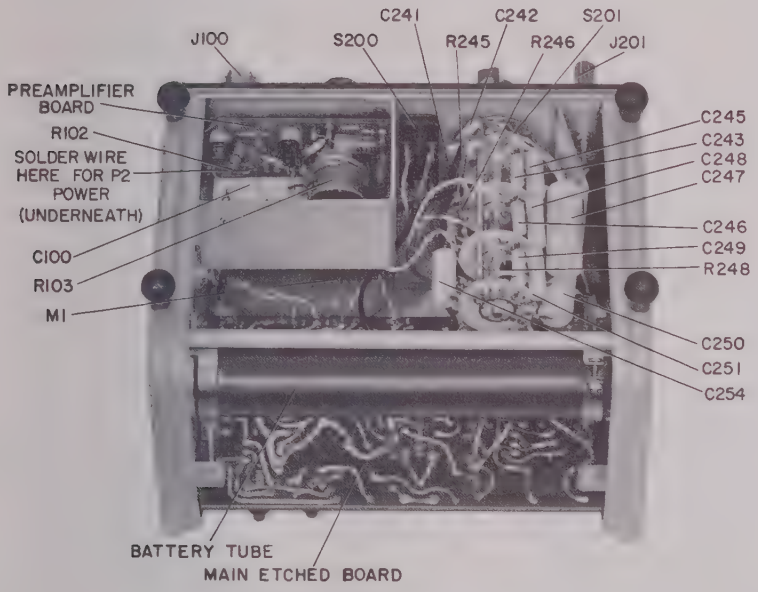


Figure 7-B. Bottom interior view of the Type 1232-A.

Figure 8. Interior of the Type 1232-P2.

PARTS LIST

Ref. No.	Description	GR Part No.	Fed. Mfg. Code	Mfg. Part No.	Fed. Stock No.
CAPACITORS					
C100	Plastic, 0.15 μF ±10% 600 V	4860-9400	84411	663F, 0.15 μF ±10%	5910-079-1703
C101	Electrolytic, 1 μF ±20% 35 V	4450-4300	56289	150D105X0035A2	5910-726-5003
C102	Electrolytic, 100 μF ±20% 15 V	4450-2800	56289	D17872	5910-034-5368
C103	Electrolytic, 6.8 μF ±20% 6 V	4450-4800	56289	150D685X0010A2	5910-936-1332
C104	Electrolytic, 4.7 μF ±20% 10 V	4450-4700	56289	150D465X0015B2	5910-813-8160
C200	Electrolytic, 5 μF 50 V	4450-3900	37942	204059S9C10X3	5910-448-5527
C201	Mica, 220 pF ±10%	4620-1220	72136	CM15, 220 pF ±10%	
C202	Trimmer, 8-50 pF ±5%	4910-1170	72982	557-051, 8-50 pF	5910-083-6446
C204	Mica, 30 pF ±10%	4620-0650	72136	CM15, 30 pF ±10%	
C205	Electrolytic, 200 μF 6 V	4450-2610	37942	TT, 200 μF 6 V	5910-945-1836
C206	Mica, 100 pF ±10%	4620-1000	72136	CM15, 100 pF ±10%	
C207	Electrolytic, 100 μF 25 V	4450-2900	56289	D17872	5910-799-9280
C208	Electrolytic, 100 μF 25 V	4450-2900	56289	D17872	5910-799-9280
C209	Plastic, 0.22 μF ±10% 100 V	4860-7981	84411	620S22491	5910-957-6509
C210	Electrolytic, 10 μF ±20% 20 V	4450-5100	56289	150D106X0020B2	5910-855-6343
C211	Ceramic, 680 pF ±10% NM	4400-4980	00656	BCI-I, 600 pF ±10%	
C212	Electrolytic, 5 μF 50 V	4450-3900	37942	2040595S9C10X3	5910-448-5527
C213	Ceramic, 680 pF ±10% NM	4400-4980	00656	BCI-I, 600 pF ±10%	
C214	Electrolytic, 5 μF 50 V	4450-3900	37942	2040595S9C10X3	5910-448-5527
C215	Electrolytic, 5 μF 50 V	4450-3900	37942	2040595S9C10X3	5910-448-5527
C216	Electrolytic, 5 μF 50 V	4450-3900	37942	2040595S9C10X3	5910-448-5527
C217	Electrolytic, 15 μF 15 V	4450-3700	37942	TT, 15 μF 15 V	
C218	Electrolytic, 5 μF 50 V	4450-3900	37942	2040595S9C10X3	5910-448-5527
C219	Plastic,0.464 μF ±2% 100 V	4860-7990	84411	663UW, 0.464 μF ±1% 100 V	
C220	Plastic, 0.464 μF ±2% 100 V	4860-7990	84411	663UW, 0.464 μF ±1% 100 V	
C221	Plastic, 0.464 μF ±2% 100 V	4860-7990	84411	663UW, 0.464 μF ±1% 100 V	
C222	Mica, 464 pF ±1%	4710-0535	14655	22A, 464 pF ±1%	5910-052-6547
C223	Mica, 464 pF ±1%	4710-0535	14655	22A, 464 pF ±1%	5910-052-6547
C224	Mica, 464 pF ±1%	4710-0535	14655	22A, 464 pF ±1%	5910-052-6547
C225	Mica, 0.001 μF ±1%	4710-0100	14655	22A, 0.001 μF ±1%	5910-068-0840
C226	Mica, 0.001 μF ±1%	4710-0100	14655	22A, 0.001 μF ±1%	5910-068-0840
C227	Mica, 0.001 μF ±1%	4710-0100	14655	22A, 0.001 μF ±1%	5910-068-0840
C230	Plastic, 0.01 μF ±2% 100 V	4860-7650	84411	663 UW, 0.01 μF ±2%	
C231	Plastic, 0.00681 μF ±2% 200 V	4860-7505	84411	663UW, 0.00681 μF ±2%	
C239	Electrolytic, 6.8 μF ±20% 6 V	4450-4800	56289	150D685X0010A2	5910-936-1332
C240	Plastic, 0.015 μF ±10% 100 V	4860-7655	84411	663UW, 0.015 μF ±10%	
C241	Plastic,0.0022 μF ±10% 200 V	4860-7329	84411	663U W, 0.0022 μF ±10%	
C242	Plastic, 0.001 μF ±10% 200 V	4860-7309	84411	663UW, 0.001 μF ±10%	
C243	Plastic, 0.00947 μF ±1% 100 V	4860-7553	84411	663UW, 0.00947 μF ±1%	
C244	Plastic, 1 μF ±1% 100 V	4860-8002	84411	663UW, 1 μF ±1%	
C245	Plastic, 0.1 μF ±1% 100 V	4860-8251	84411	663UW, 0.1 μF ±1%	
C246	Plastic, 0.01 μF ±1% 100 V	4860-7650	84411	663UW, 0.01 μF ±2%	
C247	Plastic, 1 μF ±1% 100 V	4860-8002	84411	663UW, 1 μF ±1%	
C248	Plastic, 0.1 μF ±1% 100 V	4860-8251	84411	663UW, 0.1 μF ±1%	
C249	Plastic, 0.01 μF ±1% 100 V	4860-7650	84411	663UW, 0.01 μF ±1%	
C250	Plastic, 1 μF ±1% 100 V	4860-8002	84411	663UW, 1 μF ±1%	
C251	Plastic, 0.1 μF ±1% 100 V	4860-8251	84411	663UW, 0.1 μF ±2%	
C252	Plastic, 0.0033 μF ±10% 200 V	4860-7359	84411	663UW, 0.0033 μF ±10%	
C253	Plastic, 0.047 μF ±10% 100 V	4860-8200	84411	663UW, 0.047 μF ±10%	
C254	Plastic, 0.22 μF ±10% 100 V	4860-7981	84411	620S 22491	5910-957-6509
C255	Electrolytic, 4.7 μF ±20% 10 V	4450-4700	56289	150D465X0015B2	5910-813-8160
C256	Mica, 0.001 μF ±10%	4660-6400	72136	CM20B, 0.001 μF ±10%	
C257	Ceramic, 100 pF ±10%	4404-1108	72982	831, 100 pF ±10%	
DIODES					
CR100 thru CR103	SEMICONDUCTOR, Type 1N3253	6081-1001	79089	1N3253	5961-814-4251
CR200 thru CR203	SEMICONDUCTOR Type 1N3253	6081-1001	79089	1N3253	5961-814-4251
CR204 thru CR205	SEMICONDUCTOR, Type 1N191	6082-1008	93916	1N191	5961-296-3360

PARTS LIST (cont)

Ref. No.	Description	GR Part No.	Fed. Mfg. Code	Mfg. Part No.	Fed. Stock No.
TRANSISTORS					
Q100	SEMICONDUCTOR, Type 2N929	8210-1002	01295	2N929	5960-226-8578
Q101	SEMICONDUCTOR, Type 2N169A	8210-1692	24454	4JX2D739 (2N169A)	
Q200	SEMICONDUCTOR, Type 2N169A	8210-1692	24454	4JX2D739 (2N169A)	
Q201	SEMICONDUCTOR, Type 2N1395	8210-1045	01295	2N2188	5960-065-5373
Q202	SEMICONDUCTOR, Type 2N1395	8210-1045	01295	2N2188	5960-065-5373
Q203	SEMICONDUCTOR, Type 2N169A	8210-1692	24454	4JX2D739 (2N169A)	
Q204	SEMICONDUCTOR, Type 2N169A	8210-1692	24454	4JX2D739 (2N169A)	
Q205	SEMICONDUCTOR, Type 2N169A	8210-1692	24454	4JX2D739 (2N169A)	
RESISTORS					
R100	Composition, 3.3 MΩ ±5% 1/2 W	6100-5335	01121	RC20GF335J	5905-279-1883
R101	Composition, 200 kΩ ±5% 1/2 W	6100-4225	01121	RC20GF224J	5905-192-0667
R102	Composition, 2.2 kΩ ±5% 1/2 W	6100-2225	01121	RC20GF222J	5905-279-1876
R103A	POTENTIOMETER, Dual 500 kΩ	1232-0400	24655	1232-0400	5905-052-8582
R103B	POTENTIOMETER, Dual 10 kΩ	1232-0400	24655	1232-0400	5905-052-8582
R104	Composition, 220 kΩ ±5% 1/2 W	6100-4225	01121	RC20GF224J	5905-192-0667
R105	Composition, 22 kΩ ±5% 1/2 W	6100-3225	01121	RC20GF223J	5905-171-2004
R106	Composition, 18 kΩ ±5% 1/2 W	6100-3185	01121	RC20GF183J	5905-279-3500
R200	Composition, 33 kΩ ±5% 1/2 W	6100-3335	01121	RC20GF333J	5905-171-1998
R201	Composition, 33 kΩ ±5% 1/2 W	6100-3335	01121	RC20GF333J	5905-171-1998
R203	Composition, 1 kΩ ±5% 1/2 W	6100-2105	01121	RC20GF102J	5905-195-6806
R204	Composition, 220 kΩ ±5% 1/2 W	6100-4225	01121	RC20GF224J	5905-192-0667
R205	Composition, 220 kΩ ±5% 1/2 W	6100-4225	01121	RC20GF224J	5905-192-0667
R206	Composition, 1 kΩ ±5% 1/2 W	6100-2105	01121	RC20GF102J	5905-195-6806
R207	Composition, 22 kΩ ±5% 1/2 W	6100-3225	01121	RC20GF223J	5905-171-2004
R208	Composition, 470 Ω ±5% 1/2 W	6100-1475	01121	RC20GF471J	5905-192-3973
R210	Composition, 22 kΩ ±5% 1/2 W	6100-3225	01121	RC20GF223J	5905-171-2004
R211	Composition, 1.5 kΩ ±5% 1/2 W	6100-2155	01121	RC20GF152J	5905-841-7461
R212	Composition, 10 kΩ ±5% 1/2 W	6100-3105	01121	RC20GF103J	5905-185-8510
R213	Composition, 470 Ω ±5% 1/2 W	6100-1475	01121	RC20GF471J	5905-192-3973
R214	Composition, 110 kΩ ±5% 1/2 W	6100-4115	01121	RC20GF114J	5905-279-1867
R215	Composition, 150 kΩ ±5% 1/2 W	6100-4155	01121	RC20GF154J	5905-279-2522
R216	Composition, 27 kΩ ±5% 1/2 W	6100-3275	01121	RC20GF273J	5905-279-3499
R217	Composition, 22 kΩ ±5% 1/2 W	6100-3225	01121	RC20GF223J	5905-171-2004
R218	Composition, 100 kΩ ±5% 1/2 W	6100-4105	01121	RC20GF104J	5905-195-6761
R220	Composition, 4.7 kΩ ±5% 1/2 W	6100-2475	01121	RC20GF472J	5905-279-3504
R221	Composition, 2.7 kΩ ±5% 1/2 W	6100-2275	01121	RC20GF272J	5905-279-1880
R222	Composition, 47 kΩ ±5% 1/2 W	6100-3475	01121	RC20GF473J	5905-254-9201
R223	Composition, 10 kΩ ±5% 1/2 W	6100-3105	01121	RC20GF103J	5905-185-8510
R224	Composition, 12 kΩ ±5% 1/2 W	6100-3125	01121	RC20GF123J	5905-279-3502
R225	Composition, 3.9 kΩ ±5% 1/2 W	6100-2395	01121	RC20GF392J	5905-279-3505
R226	Composition, 3.3 kΩ ±5% 1/2 W	6100-2335	01121	RC20GF332J	5905-279-3506
R227	Composition, 1.8 kΩ ±5% 1/2 W	6100-2185	01121	RC20GF182J	5905-190-8881
R228	Composition, 2.7 kΩ ±5% 1/2 W	6100-2305	01121	RC20GF302J	5905-279-1751
R230	Composition, 9.1 kΩ ±5% 1/2 W	6100-2915	01121	RC20GF912J	5905-249-4200
R231	Composition, 22 kΩ ±5% 1/2 W	6100-3225	01121	RC20GF223J	5905-171-2004
R232	Composition, 9.1 kΩ ±5% 1/2 W	6100-2915	01121	RC20GF912J	5905-249-4200
R233	Film, 31.6 kΩ ±1% 1/8 W	6250-2316	75042	CEA, 31.6 kΩ ±1%	5905-702-1765
R234	Film, 31.6 kΩ ±1% 1/8 W	6250-2316	75042	CEA, 31.6 kΩ ±1%	5905-702-1765
R235	Film, 3.32 kΩ ±1% 1/8 W	6250-1332	75042	CEA, 3.32 kΩ ±1%	
R236	Film, 3.32 kΩ ±1% 1/8 W	6250-1332	75042	CEA, 3.32 kΩ ±1%	
R237	Film, 40.2 kΩ ±1% 1/8 W	6250-2402	75042	CEA, 40.2 kΩ ±1%	5905-801-8119
R238	Composition, 1 kΩ ±5% 1/2 W	6100-2105	01121	RC20GF102J	5905-195-6806
R239	Film, 5.11 kΩ ±1% 1/8 W	6250-1511	75042	CEA, 5.11 kΩ ±1%	5905-577-6734
R240	Film, 5.11 kΩ ±1% 1/8 W	6250-1511	75042	CEA, 5.11 kΩ ±1%	5905-577-6734
R241	Film, 1.1 kΩ ±1% 1/8 W	6250-1110	75042	CEA, 1.1 kΩ ±1%	5905-577-1791
R242	Film, 4.99 kΩ ±1% 1/8 W	6250-1499	75042	CEA, 4.99 kΩ ±1%	
R243	Film, 4.99 kΩ ±1% 1/8 W	6250-1499	75042	CEA, 4.99 kΩ ±1%	
R244	Film, 1.05 kΩ ±1% 1/8 W	6250-1105	75042	CEA, 1.05 kΩ ±1%	5905-683-5713
R245	Composition, 1.8 kΩ ±5% 1/2 W	6100-2185	01121	RC20GF182J	5905-190-8881
R246	Composition, 3.3 kΩ ±5% 1/2 W	6100-2335	01121	RC20GF332J	5905-279-3506
R247	Film, 19.6 Ω ±1% 1/2 W	6450-9196	75042	CEC, 17.6 Ω ±1%	5905-581-1030
R248	Film, 6.65 kΩ ±1% 1/2 W	6450-1665	75042	CEC, 6.65 kΩ ±1%	5905-581-4975
R249	Composition, 200 kΩ ±5% 1/2 W	6100-4205	01121	RC20GF204J	5905-171-2003
R250	POTENTIOMETER, Wire wound, 3.25 kΩ 1/2 W	0975-4040	24655	0975-4040	
R251	Composition, 2.7 kΩ ±5% 1/2 W	6100-2275	01121	RC20GF272J	5905-279-1880

PARTS LIST (Cont)

Ref. No.	Description	GR Part No.	Fed. Mfg. Code	Mfg. Part No.	Fed. Stock No.
MISCELLANEOUS					
BT1	BATTERY, Drycell, mercury, type M72*	8410-1372	76149	RM-4R	6135-266-9762
J100	CONNECTOR, Coaxial Locking, INPUT	0874-4181	24655	0874-4181	
J102	JACK, Phone, NC, EXTERNAL FILTER	4260-0400	82389	23-1439	5935-857-6751
J103	JACK, Pin, B+ for Type 1232-P2	4260-1010	91916	SKT-8	
J200	JACK, Binding post OUTPUT	4060-0100	24655	4060-0100	5940-626-9922
J201	JACK, Binding post OUTPUT	4060-0100	24655	4060-0100	5940-626-9922
L200	INDUCTOR, Choke, 2200 μH ±10%	4300-6370	99800	3500, 2200 μH ±10%	5950-088-9939
L201	INDUCTOR, Choke, 1000 μH ±10%	4300-5000	99800	3500, 1000 μH ±10%	5950-820-1227
L202	INDUCTOR, Choke, 390 μH ±10%	4300-4390	99800	3500-22, 390 μH ±10%	
M1	METER, 100 μA	5730-1220	94271	91992, Model 1907	6625-053-4794
S100	SWITCH, SPST (mounted on R103)	1232-0400	24655	1232-0400	5905-052-8582
S200	SWITCH, DPDT, toggle	7910-0820	04009	82609	
S201	SWITCH, Rotary, wafer	7890-2410	76854	212342-F4C	5930-065-7995
	Filter Tuning Knob Assembly	5520-5520			
	Gain and Filter Frequency Knob Assemblies	5500-5221			
	Battery holder tube	1232-6000			
	Meter	5730-1220			
	Indicator (over Filter Tuning Dial)	5470-0650			
	End frame assembly (right)	5310-3066			
	End frame assembly (left)	5310-3067			
	Feet (4 required)	5260-0700			

*9 cells required

PARTS LIST OF THE TYPE 1232-P2

Ref. No.	Description	GR Part No.	Fed. Mfg. Code	Mfg. Part No.	Fed. Stock No.
C101	CAPACITOR, Plastic, 0.001 μF ±200 V	4860-7309	84411	663UW, 0.001 μF ±200 V	
R101	RESISTOR, Composition, 1 GΩ ±20% 1/2 W	6100-8108	01121	EB, 1 GΩ ±20%	
R102	RESISTOR, Composition, 10 kΩ ±5% 1/2 W	6100-3105	01121	RC20GF103J	5905-185-8510
R103	RESISTOR, 1 kΩ ±5% 1/2 W	6100-2105	01121	RC20GF102J	5905-195-6806
Q101	TRANSISTOR, Field Effect, Type C6601A	8210-1082	94589	D3068A	
S101	SWITCH, Toggle, DPDT	7910-0791	95146	MST-205N	

FEDERAL MANUFACTURER'S CODE

From Federal Supply Code for Manufacturers Cataloging Handbooks H4-1
(Name to Code) and H4-2 (Code to Name) as supplemented through August, 1968.

Code	Manufacturer
00192	Jersee Mfg. Co, Chicago, Illinois
00194	Wyleco Electronics Corp, L.A., Calif.
00434	Schweber Electronics, Westbury, L.I., N.Y.
00656	Aerovox Corp, New Bedford, Mass.
01006	Alden Products Co, Brockton, Mass.
01121	Allen-Bradley Co, Milwaukee, Wisc.
01295	Texas Instruments, Inc, Dallas, Texas
02114	Ferroxcube Corp, Saugerties, N.Y. 12477
02606	Fenwal Lab Inc, Morton Grove, Ill.
02660	Amphenol Electron Corp, Broadview, Ill.
02768	Fairex, Des Plaines, Ill. 60018
03508	G.E. Semicon Prod, Syracuse, N.Y. 13201
03797	Eldema Corp, Compton, Calif.
03888	Pyrofilm Resistor Co, Cedar Knolls, N.J.
03911	Clairex Corp, New York, N.Y. 10001
04009	Arrowhart & Hegeman, Hartford, Conn. 06106
04713	Motorola, Phoenix, Ariz. 85008
05170	Engr'd Electronics, Santa Ana, Calif. 92702
05624	Barber-Colman Co, Rockford, Ill. 61101
05820	Wakefield Eng. Inc, Wakefield, Mass. 01880
07126	Digitron Co, Pasadena, Calif.
07127	Eagle Signal (E.W. Bliss Co), Baraboo, Wisc.
07263	Fairchild Semi. Div, Mountain View, Calif. 94040
07263	Fairchild Camera, Mountain View, Calif.
07367	Bircher Corp, No. Los Angeles, Calif.
07699	Amer Semicond, Arlington Hts, Ill. 60004
07828	Bodine Corp, Bridgeport, Conn. 06608
07829	Bodine Electric Co, Chicago, Ill. 60618
07910	Cont Device Corp, Hawthorne, Calif.
07983	Ohmite Mfg Co, Skokie, Ill.
07999	Berg Inst., Delaware, Wisc. 52119
08179	Electro Motive Mfg Co Inc, Willimantic, N.J.
08732	G.E. Semiconductor, Buffalo, N.Y.
09408	Stan-Tronics Inc, Georgetown, Mass. 01833
09823	Burgess Battery Co, Freeport, Ill.
09922	Burndy Corp, Norwalk, Conn. 06852
11236	C.T.S. of Berne, Inc, Berne, Ind. 46711
11599	Chandler Evans Corp, W. Hartford, Conn.
12040	National Semiconductor, Danbury, Conn.
12468	Crystalonics, Cambridge, Mass. 02140
12697	RCA, Woodbridge, N.J.
12697	Clarostat Mfg Co, Inc, Dover, N.H. 03820
13327	Solitron Devices, Inc, Riviera Beach, Fla.
13327	Solitron Devices, Tappan, N.Y. 10983
14433	ITT Semiconductors, W.Palm Beach, Fla.
14655	Cornell-Dubilier Electric Co, Newark, N.J.
14674	Corning Glass Works, Corning, N.Y.
14936	General Instrument Corp, Hicksville, N.Y.
15238	ITT, Semiconductor Div, Lawrence, Mass.
15818	Cutler-Hammer Inc, Milwaukee, Wisc. 53233
16037	Spruce Pine Mica Co, Spruce Pine, N.C.
16179	Singer Co, Diehl Div, Somerset, N.J.
16299	Lenox-Fugle Inc, Victor-Ills, Chicago, Ill.
16464	Lambda Electronics, Jamaica, N.Y.
16701	Electra Mfg Co, Independence, Kansas 67301
21335	Fafnir Bearing Co, New Britain, Conn.
22753	U10 Electronics Corp, Hollywood, Fla.
23342	Amet Electronics Corp, Franklin Park, Ill.
24446	G.E., Schenectady, N.Y. 12305
24454	G.E., Electronics Comp, Syracuse, N.Y.
24655	G.E. Lamp Div, Nela Park, Cleveland, Ohio
24655	General Radio Co, W. Concord, Mass. 01781
24931	Specialty Connector Co, Indianapolis, Ind.
25520	Haydon Mfg Co, Kendaville, Ind.
28959	Hoffman Electronics Corp, El Monte, Calif.
29874	I.B.M. Armonk, New York
22001	Jensen Mfg. Co, Chicago, Ill. 60638
33173	G.E. Comp, Owensboro, Ky. 42301
35928	Constantia Co, Mont. 18, Que.
37942	P.R. Mallory & Co Inc, Indianapolis, Ind.
38443	Martin-Rockwell Corp, Jamestown, N.Y.
40931	Honeywell Inc, Minneapolis, Minn. 55408
42190	Muter Co, Chicago, Ill. 60638
42498	National Co, Inc, Melrose, Mass. 02176
42991	Norma-Hoffman, Stamford, Conn. 06904

Code	Manufacturer
43671	RCA, New York, N.Y. 10020
46956	Raytheon Mfg Co, Waltham, Mass. 02154
53021	Sangamo Electric Co, Springfield, Ill. 62708
54294	Shallcross Mfg Co, Selma, N.C.
54715	Shure Brothers, Inc, Evanston, Ill.
56289	Sprague Electric Co, N. Adams, Mass.
58730	Thomas and Betts Co, Elizabeth, N.J. 07207
59875	TRW Inc, (Accessories Div), Cleveland, Ohio
60299	Torrington Mfg Co, Torrington, Conn.
61637	Union Carbide Corp, New York, N.Y. 10017
61864	United-Carr Fastener Corp, Boston, Mass.
63060	Victoreen Instrument Co, Inc, Cleveland, O.
63743	Ward Leonard Elec Co, Mt. Vernon, N.Y.
65063	Westinghouse (Lamp Div), Bloomfield, N.J.
65092	Weston Instruments, Newark, N.J.
70485	Atlantic-India Rubber, Chicago, Ill. 60607
70563	Amperite Co, Union City, N.J. 07087
70903	Belden Mfg Co, Chicago, Ill. 60644
71128	Bronson, Homer D. Co, Beacon Falls, Conn.
71194	Canfield, H.G. Co, Clifton Forge, Va. 24422
71400	Bussman (McGraw Edison), St. Louis, Mo.
71450	CTS of Berne, Inc, Berne, Ind.
71590	Centralab, Div of Globe-Union, Inc, Milwaukee, Wisc. 53212
71707	Cohu Electronics Co, Inc, New York, N.Y.
71707	Cohu Coil Co Inc, Providence, R.I.
71744	Chicago Miniature Lamp Works, Chicago, Ill.
71785	Cinch Mfg Co, Chicago, Ill. 60624
71823	Darnell Corp, Ltd, Downey, Calif. 90241
72136	Electro Motive Mfg Co, Wilmington, Conn.
72259	Nytronics Inc, Berkeley Heights, N.J. 07922
72619	Dialight Co, Brooklyn, N.Y. 11237
72699	General Instr Corp, Newark, N.J. 07104
72765	Drake Mfg Co, Harwood Hts, Ill. 60656
72825	Hugh H. Eby Inc, Philadelphia, Penn. 19144
72962	Elastic Stop Nut Corp, Union, N.J. 07083
72982	Erie Technological Products Inc, Erie, Penn.
73138	Beckman Inc, Fullerton, Calif. 92634
73445	Amperex Electronics Co, Hicksville, N.Y.
73559	Carling Electric Co, W.Hartford, Conn.
73690	Elco Resistor Co, New York, N.Y.
73899	JFD Electronics Corp, Brooklyn, N.Y.
74193	Heinemann Electric Co, Trenton, N.J.
74868	Industrial Condenser Corp, Chicago, Ill.
74970	E.F. Johnson Co, Waseca, Minn. 56093
75042	IRC Inc, Philadelphia, Penn. 19108
75382	Kulka Electric Corp, Mt. Vernon, N.Y.
75491	Lafayette Industrial Electronics, Jamica, N.Y.
75606	Linden and Co, Providence, R.I.
75818	Lindstrom, Inc, Des Plaines, Ill. 60016
76005	Lord Mfg Co, Erie, Penn. 16512
76068	Stackpole Carbon Co, St. Marys, Penn.
76222	James Millen Mfg Co, Malden, Mass. 02148
76545	Mueller Electric Co, Cleveland, Ohio 44114
76699	National Tube Co, Pittsburg, Penn.
76854	Oak Mfg Co, Crystal Lake, Ill.
77147	Patton MacGuyer Co, Providence, R.I.
77169	Pee-Seymour, Syracuse, N.Y.
77263	Penn Roberts Rubber Co, Trenton, N.J.
77330	Positive Lockwasher Co, Newark, N.J.
77842	Rex-O-Var Co, Madison, Wisc.
77630	TRW, Electronic Comp, Camden, N.J. 08103
77820	Reliance Electric & Eng Co, Cleveland, O.
78189	Shakeproof (Ill. Tool Works), Elgin, Ill. 60120
78277	Sigma Instruments Inc, S.Braintree, Mass.
78488	Stackpole Carbon Co, St. Marys, Penn.
78553	Tinnerman Products, Inc, Cleveland, Ohio
79089	RCA, Rac Tube & Semicond, Harrison, N.J.
79725	Wilremold Co, Hartford, Conn. 06110
79963	Zierick Mfg Co, New Rochelle, N.Y.
80030	Prestole Fastner, Toledo, Ohio
80048	Vickers Inc, St. Louis, Mo.
80131	Electronic Industries Assn, Washington, D.C.
80207	Tung-Sol Electric Inc, N. Adams, Mass.
80213	Motorola Inc, Franklin Park, Ill. 60131
80258	Standard Oil Co, Lafayette, Ind.
80294	Bourns Inc, Riverside, Calif. 92506

Code	Manufacturer
80431	Air Filter Corp, Milwaukee, Wisc. 53213
80583	Hammarlund Co, Inc, New York, N.Y.
80760	Beckman Instruments, Inc, Fullerton, Calif.
81030	General Semiconductor, Tempe, Ariz.
81073	Grayhill Inc, LaGrange, Ill. 60525
81140	Isolantite Mfg Corp, Stirling, N.J. 07980
81349	Military Specifications
81380	Joint Army-Navy Specifications
81751	Columbus Electronics Corp, Yonkers, N.Y.
81831	Filtron Co, Flushing, L.I., N.Y. 11354
81840	Leden Inc, Dayton, Ohio 45402
81860	Barry-Wright Corp, Watertown, Mass.
82142	Fabri-Tek Inc, Minneapolis, Minn.
82373	Indiana Fastener & Model Works, Lafort, Ind.
82389	Switchcraft Inc, Chicago, Ill. 60630
82647	Metals & Controls Inc, Attleboro, Mass.
82807	Milwaukee Resistor Co, Milwaukee, Wisc.
83003	Meissner Mfg. (Maguire Ind) Mt. Carmel, Ill.
83058	Carr Fastener Co, Cambridge, Mass.
83186	Victory Engineering, Springfield, N.J. 07081
83361	Bearing Specialty Co, San Francisco, Calif.
83740	Solar Electric Corp, Warren, Penn.
83760	Union Carbide Corp, New York, N.Y. 10017
84171	Arco Electronics, Great Neck, N.Y.
84411	TRW Capacitor Div, Ogallala, Nebr.
84835	Lehigh Metal Prods, Cambridge, Mass. 02140
84971	T.A. Mfg Corp, Los Angeles, Calif.
86577	Precision Metal Prods, Stoneham, Mass. 02180
86684	RCA (Elect. Comp & Dev), Harrison, N.J.
86887	REC Corp, New Rochelle, N.Y. 10801
86926	Cont Electronics Corp, Brooklyn, N.Y. 11232
88140	Cutler-Hammer Inc, Lincoln, Ill.
88245	Litton Industries, Beverly Hills, N.J.
88419	Connell-Dunbar, Fraser-Vertex, N.C.
88827	K & G Mfg Co, New York, N.Y.
89462	Heizler-Calvin Corp, Boston, Mass.
89665	United Transformer Co, Chicago, Ill.
90201	Mallory Capacitor Co, Indianapolis, Ind.
90750	Westinghouse Electric Corp, Boston, Mass.
90952	Hardware Products Co, Reading, Penn. 19602
91032	Continental Wire Corp, York, Penn. 17405
91146	ITT Cannon Electric (Int'l), Phoenix, Ariz.
91293	Johanson Mfg Co, Boonton, N.J. 07005
91345	Miller, J.W. Co, Compton, Calif. 90220
91506	Chandler Co, Wethersfield, Conn. 06109
91637	Dale Electronics Inc, Columbus, Nebr.
91662	Elco Corp, Willow Grove, Penn.
91718	General Instruments, Inc, Dallas, Texas
91929	Honeywell Inc, Freeport, Ill.
92519	Electro Inst Corp, Woodside, L.I., N.Y.
92825	G.E. Co, Owensboro, Ky.
92832	Sub-Min-Ature Prods, Inc, Woburn, Mass.
93410	Cramer Products Co, New York, N.Y. 10013
94144	Raytheon Co, Components Div, Quincy, Mass.
94154	Tung-Sol Electric Inc, Newark, N.J.
95076	Garde Mfg Co, Cumberland, R.I.
95121	Quality Components Inc, St. Mary's, Penn.
95146	Alco Electronics Mfg Co, Lawrence, Mass.
95238	Continental Connector Corp, Woodside, N.Y.
95275	Vitramon, Inc, Bridgeport, Conn.
95354	Methode Mfg Co, Chicago, Ill.
95712	Modern Industries, Inc, Chicago, Ill.
95796	Anaconda Amer Brass Co, Torrington, Conn.
96095	Hi-Q Div, of Aerovox Corp, Orlean, N.Y.
96214	Texas Instruments Inc, Dallas, Texas 75209
96388	Thordarson-Meisner, Mt. Carmel, Ill.
96341	Microwave Associates Inc, Burlington, Mass.
96791	Amphenol Corp, Janesville, Wisc. 53545
96850	Military Standards
96291	Sealectro Corp, Mamaroneck, N.Y. 10544
96474	Connecticut Telephone & Elect.
96821	Vernitron Electronics Inc, Glen Cove, N.Y.
96892	Electron Electronics Corp, Melrose, Mass.
99313	Varian, Palo Alto, Calif. 94303
99378	Aldex Corp, Winchester, Mass. 01890
99800	Delevan Electronics Corp, E. Aurora, N.Y.

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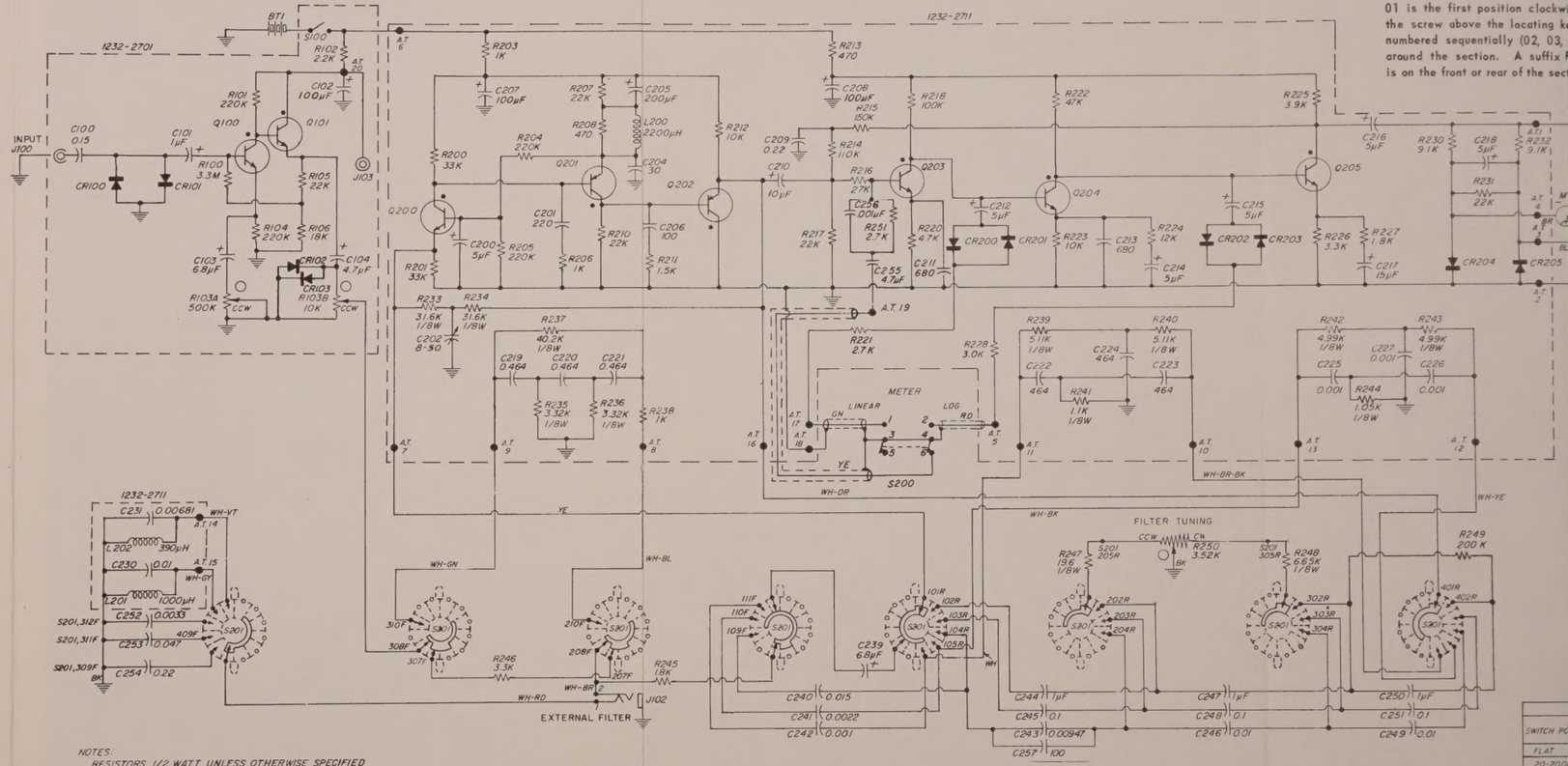
Rotary switch sections are shown as viewed from the panel end of the shaft. The first digit of the contact number refers to the section. The section nearest the panel is 1, the next section back is 2, etc. The next two digits refer to the contact. Contact 01 is the first position clockwise from a strut screw (usually the screw above the locating key), and the other contacts are numbered sequentially (02, 03, 04, etc), proceeding clockwise around the section. A suffix F or R indicates that the contact is on the front or rear of the section, respectively.



NOTES:
RESISTORS 1/2 WATT UNLESS OTHERWISE SPECIFIED
RESISTANCE IN OHMS UNLESS OTHERWISE SPECIFIED
K = 1000 OHMS M = 1 MEGOHM
CAPACITANCE VALUES ONE AND OVER IN MICROMICROFARADS (PICOFARADS), LESS THAN ONE IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.

○ KNOB CONTROL

Figure 9. Schematic diagram of the Type 1232-A Tuned Amplifier and Null Detector.

S201 SWITCHING DIAGRAM

SWITCH POSITION	SWITCH SECTIONS							
	1F	1R	2F	2R	3F	3R	4F	4R
FLAT	7-12	1-8	7-8		7-8			
20-200C	7-12	1-2-8	7-8	1-2	7-8	1-2	7-8	1-2
200C-2KC	7-12	1-3-8	8-10	1-3	6-10	1-3	7-9	1-3
2-20KC	7-9	1-4	8-10	1-4	8-10	1-4	7-10	1-4
50KC	7-10	1-5	8-10		8-10		7-11	1-5
100KC	7-11	1-6	8-10		8-10		7-12	1-6

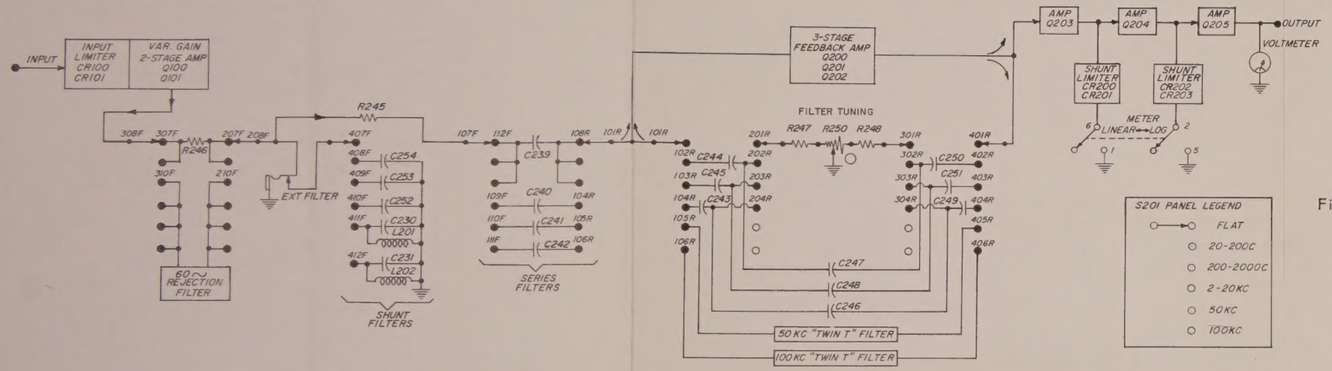
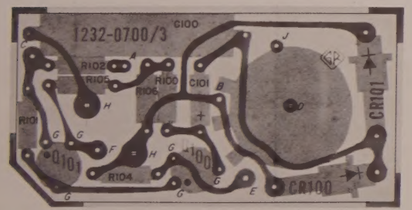


Figure 10. Block diagram of the Type 1232-A Tuned Amplifier and Null Detector.

NOTE: The number appearing on the foil side is not the part number. The dot on the foil at the transistor socket indicates the collector lead.



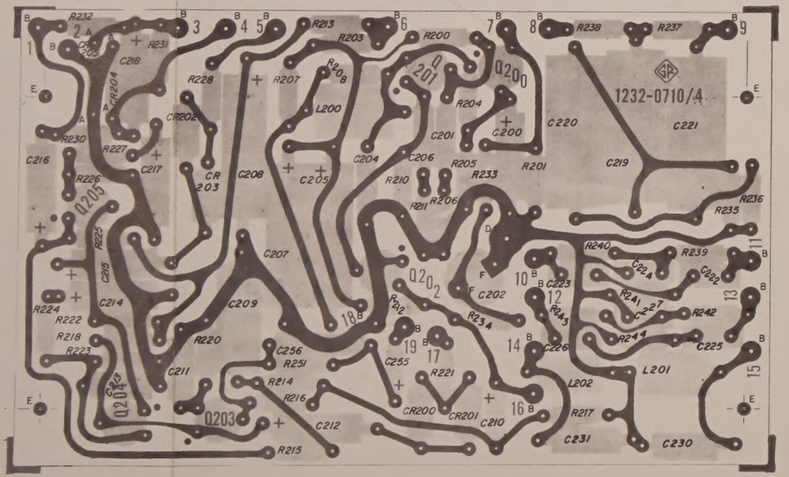
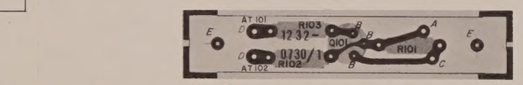


Figure 11. Etched Board Layout of the Type 1232-A Tuned Amplifier and Null Detector, P/N's 1232-2700 and 1232-WUQP respectively.



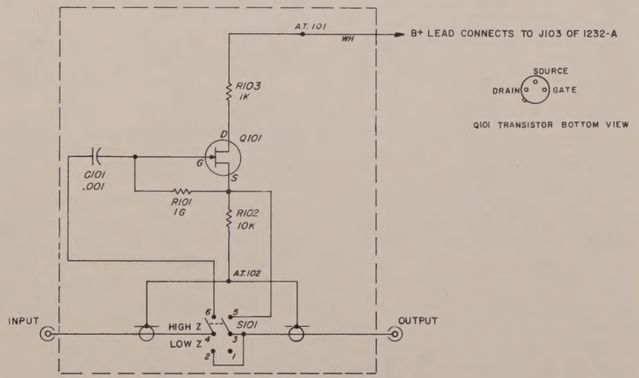


Figure 12. Schematic diagram and etched board layout of the Type 1232-P2 Preamplifier. The etched board part number is 1232-2730.

TYPE 874 COAXIAL COMPONENTS

TYPE 874 CABLE CONNECTORS

APPLICABLE CABLE TYPES		CONNECTOR TYPE	CABLE	CABLE LOCKING	PANEL FLANGED	PANEL LOCKING	PANEL LOCKING RECESSED
50-OHM		874-A2	-CA	-CLA	-PBA	-PLA	-PRLA
		RG-8A/U RG-9B/U RG-10A/U RG-87A/U RG-116/U RG-156/U RG-165/U RG-166/U RG-213/U RG-214/U RG-215/U RG-225/U RG-227/U	-C8A	-CL8A	-PB8A	-PL8A	-PRL8A
NON-50-OHM		RG-11A/U RG-12A/U RG-13A/U RG-63B/U RG-79B/U RG-89/U RG-144/U RG-146/U RG-149/U RG-216/U					
50-OHM		874-A3 RG-29/U RG-50/U (Series) RG-58/U (Series) RG-141A/U RG-142A/U RG-159/U RG-223/U	-C58A	-CL58A	-PB58A	-PL58A	-PRL58A
NON-50-OHM		RG-59/U RG-62/U (Series) RG-71B/U RG-140/U RG-210/U	-C62A	-CL62A	-PB62A	-PL62A	-PRL62A
50-OHM		RG-174/U RG-188/U RG-316/U	-C174A	-CL174A	-PB174A	-PL174A	-PRL174A
NON-50-OHM		RG-161/U RG-187/U RG-179/U					

Example: For a locking cable connector for RG-8A/U, order Type 874-CL8A.

TYPE 874 ADAPTORS

TO TYPE		874-
BNC	plug	QBJA QBJL* QBPA
	jack	
C	plug	QCJA QCJL* QCP
	jack	
HN	plug	QHJA QHPA
	jack	
LC	plug	QLJA QLPA
	jack	
LT	plug	QLTJ QLPT
	jack	
Microdot	plug	QMDJ QMDJL* QMDP
	jack	
N	plug	QNJA QNJL* QNP QNPL*
	jack	
OSM/BRM	plug	QMMJ QMMJL* QMMP QMMPL*
	jack	
SC (Sandia)	plug	QSCJ QSCJL* QSCP
	jack	
TNC	plug	QTNJ QTNJL* QTNP
	jack	
UHF	plug	QUJ QUJL* QUP
	jack	
UHF 50-Ω Air Line	7/8-in. 1-5/8-in. 3-1/8-in.	QUJA QUJ QUJA

*Locking Type 874 Connector

Example: To connect Type 874 to a type N jack, order Type 874-QNP.

CONNECTOR ASSEMBLY TOOLS

TYPE 874-	FUNCTION
TCK	Tool Kit
TOS8	Crimping Tool
TO8	Crimping Tool

OTHER COAXIAL ELEMENTS

TYPE 874-		TYPE 874-	
A2	50 Ω cable (low loss)	ML	component mount
A3	50 Ω cable	MR	coupling probe
D20L, D50L	20-, 50-cm adjustable stubs	MR, MRL	mixer-rectifier
EL, EL-L	90° ell	R20A, R20LA	patch cord, double shield
F18SL	18S-Mc/s low-pass filter	R22A, R22LA	patch cord, double shield
F50OL	500-Mc/s low-pass filter	R33, R34	patch cord, single shield
F1000L	1000-Mc/s low-pass filter	T, TL	tee
F2000L	2000-Mc/s low-pass filter	TPD, TPDL	power divider
F4000L	4000-Mc/s low-pass filter	U	U-line section
FBL	bias insertion unit	UBL	balun
G3, G3L, G6, G6L G10, G10L G20, G20L	3-, 6-, 10-, and 20-dB attenuators	VCL	variable capacitor
GAL	adjustable attenuator	VI	voltmeter indicator
JR	rotary joint	VQ, VQL	voltmeter detector
K, KL	coupling capacitor	VR, VRL	voltmeter rectifier
L10, L10L L20, L20L L30, L30L	10-, 20-, and 30-cm rigid air lines	W100	100-Ω termination
LAL	33-58 cm adjustable line	W200	200-Ω termination
LK10L, LK20L	constant-Z adjustable lines	W50B, W50BL	50-Ω termination
LR	radiating line	WN, WN3, WNL	short-circuit terminations
LTL	trombone constant-Z line	WO, WO3, WOL	open-circuit terminations
		X	insertion unit
		XL	series inductor
		Y	cliplock stand
		Z	

MISCELLANEOUS COAXIAL CONNECTORS

CONNECTOR TYPE	TYPE NO.	USED WITH
Basic	874-B	50-ohm Air Line
Basic Locking	874-BBL	50-ohm Air Line
Panel Locking	874-PLT	Wire Load
Panel Locking Recessed	874-PRLT	Wire Lead
Panel Locking Feedthrough	874-PFL	Type 874 Patch Cords

L suffix indicates locking Type 874 Connector.

FOR COMPLETE DETAILS, REFER TO THE GENERAL RADIO CATALOG.

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